SERIAL μDAQ Digital I/O Series

Serial Devices User's Manual for

SRL 24A/C SRL 48A/C SRL 72A/C SRL 96A/C SRL 120A
SRL 30/26 SRL 73

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µDAQ Remote Devices

Data Acquisition and Process Control

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1. Introduction

The SERIAL μDAQ Digital I/O and analog series are Serial architecture digital input/output, counter-timer and analog I/O data acquisition devices. They are part of the μDAQ series, more specifically digital I/O and analog I/O for serial bus.

The SERIAL μDAQ DIO series has support for 24 to 120 digital input/output lines and 6 counters. They come in 5 basic models, SRL 24, SRL 48, SRL 72, SRL 96 and SRL 120.

The SERIAL μDAQ Analog Input series support 16 analog inputs and 4 analog outputs. It's available in two models, the SRL 26 that excludes analog outputs and the SRL 30 that include the analog outputs. It has full support for channel & gain list scanning.

The SERIAL μDAQ Temperature Input series supports 8, 16 and 32 temperature inputs. The two basic models are the 73T and 73R, which supports thermocouple and RTD.

Features

The SERIAL μDAQ series has some very unique features and are listed below:

- 232 and 485 compliant.
- Powered externally.
- Intel 8255 compatible digital I/O ports.
- Intel 8254 compatible counter-timer.
- Channel list and voltage range scanning @ 3 KHz.
- 14-bit Analog I/O resolution.
- Temperature inputs.
- Quick and effortlessly to install.

µDAQ Versions

The tables below list the various version that is available.

Digital I/O Series

Feature	SRL 24	SRL 48	SRL 72	SRL 96	SRL 120
Number of digital channels – A/C Version	24	48	48	96	192
Number of counters – C Version	6	6	6	6	6
Number of 8255 compatible ports (8-bit)	3	6	9	12	15
Number of interrupt sources - A Version	0	0	0	0	0
Number of interrupt sources - C Version	6	6	6	6	6

Table 1-1 SERIAL µDAQ DIO Versions

Analog Input Series

Feature	SRL 26	SRL 30	SRL 73
Number of digital I/O channels	24	24	24
Number of 8255 compatible ports (8-bit)	3	3	3
Number of analog input channels	16	16	8/16/32
Number of analog output channels	0	4	0
Analog input resolution	14-bit	14-bit	14-bit
Maximum sampling speed	3 KHz	3 KHz	1 Hz
Analog output resolution	0	14-bit	0

Table 1-2 SERIAL µDAQ Analog Input Versions

Applications

The SERIAL μDAQ series can be used in the following applications:

- Automation test equipment.
- TTL compatible status monitoring.
- Plant/Factory process control.
- Pulse counting.
- Frequency measurement.
- Frequency generation.
- Controlling and monitoring of any TTL compatible equipment.
- Mobile computing.
- Laboratory applications

Key Specifications

- 3,6,9,12 or 15 x 8-bit ports.
- 6 x 16-bit counters.
- Fully programmable digital input/output system.
- Fully programmable counter-timer system.
- Fully programmable interrupt support.
- 14-bit Resolution analog input system with a max range of ±10 volt.
- Fully programmable channel/gain list @ 3 KHz.
- 14-bit Resolution analog output system with a range of ±10 volt.

Software Support

The SERIAL μDAQ series is supported by EDR Enhanced and comes with an extensive range of examples. The software will help you to get your hardware going very quickly. It also makes it easy to develop complicated control applications. All operating system drivers, utility and test software are supplied on the EDR Enhanced CD-Rom. The latest drivers can also be downloaded from the Eagle Technology website. For further support information see the Contact Details section.

Contact Details

Below are the contact details of Eagle Technology.

Eagle Technology
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Fax +27 (021) 424 4637
E-Mail eagle@eagle.co.za
Website http://www.eagledaq.com

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2. Installation

This chapter describes how to install and configure the SERIAL μDAQ device for the first time. Minimal configuration is necessary; almost all settings are done through software. The operating system will take care of all resource assignments.

Package

SERIAL μDAQ package will contain the following:

- SERIAL μDAQ device.
- SERIAL cable.
- 9V Power Supply
- Eagle Technology Software CD-Rom.

Operating System Support

The SERIAL μDAQ support the Windows Driver Models (WDM) driver types. The operating systems are listed in the table below.

Board Type	Revision	Operating Systems	Driver Type
SRL 24A/C	Revision 1	Windows 2000/98/ME/XP	WDM PnP
SRL 48A/C	Revision 1	Windows 2000/98/ME/XP	WDM PnP
SRL 72A/C	Revision 1	Windows 2000/98/ME/XP	WDM PnP
SRL 96A/C	Revision 1	Windows 2000/98/ME/XP	WDM PnP
SRL 120A	Revision 1	Windows 2000/98/ME/XP	WDM PnP
SRL 26	Revision 1	Windows 2000/98/ME/XP	WDM PnP
SRL 30	Revision 1	Windows 2000/98/ME/XP	WDM PnP
SRL 73	Revision 1	Windows 2000/98/ME/XP	WDM PnP

Table 2-1 Operating System Support

Installation

This section will describe how to connect your serial device to your computer.

- Select any unused serial port and plug-in the one end of the serial cable.
- Plug the other end of the serial cable into your serial device.

Driver Installation

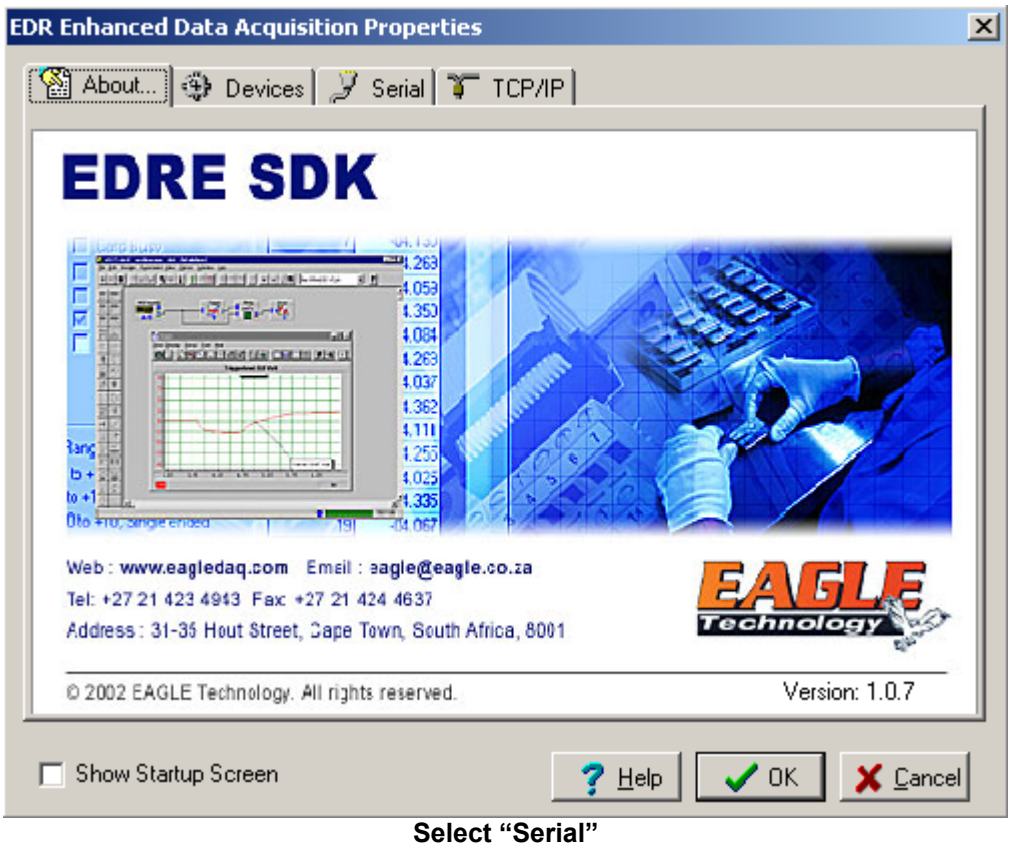
Installing the Windows 98/2000 device driver is a very straightforward task.

- Run ***edreapi.exe*** found on the Eagle CD-Rom *(eaglecd\edre\api\edreapi.exe)* and follow the on screen instructions.

Device Setup

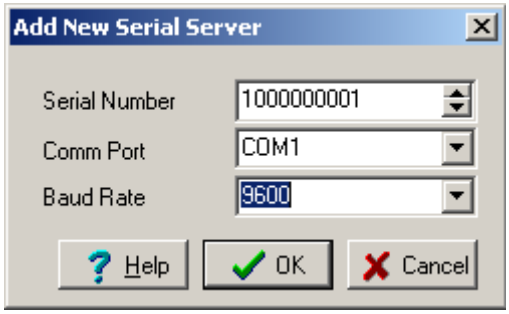
When done with the ***api*** installation the ***"EDR Enhanced Setup"*** folder can be opened form the control panel to do the device setup.

- First make sure that the device power LED is on.
- Open the ***"EDR Enhanced Setup"*** folder.



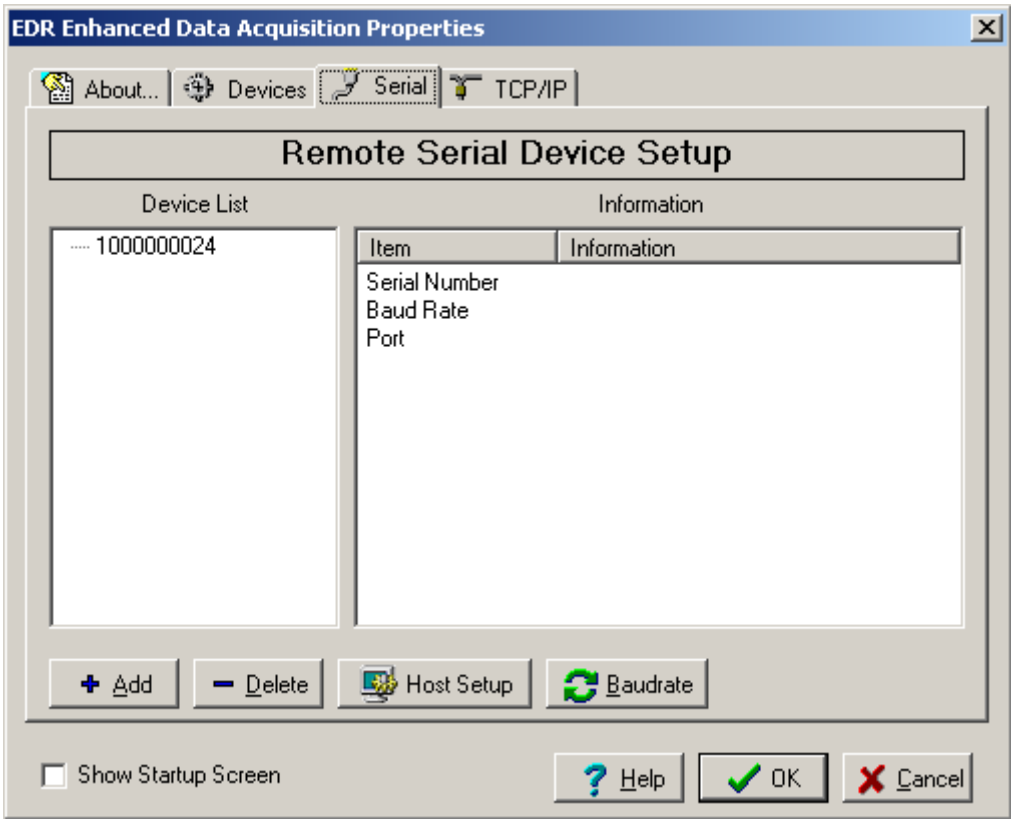
Select "Serial"

Select "Add"



- Enter the device Serial Number, select the Comm Port and select the Baud Rate.

Select "OK"

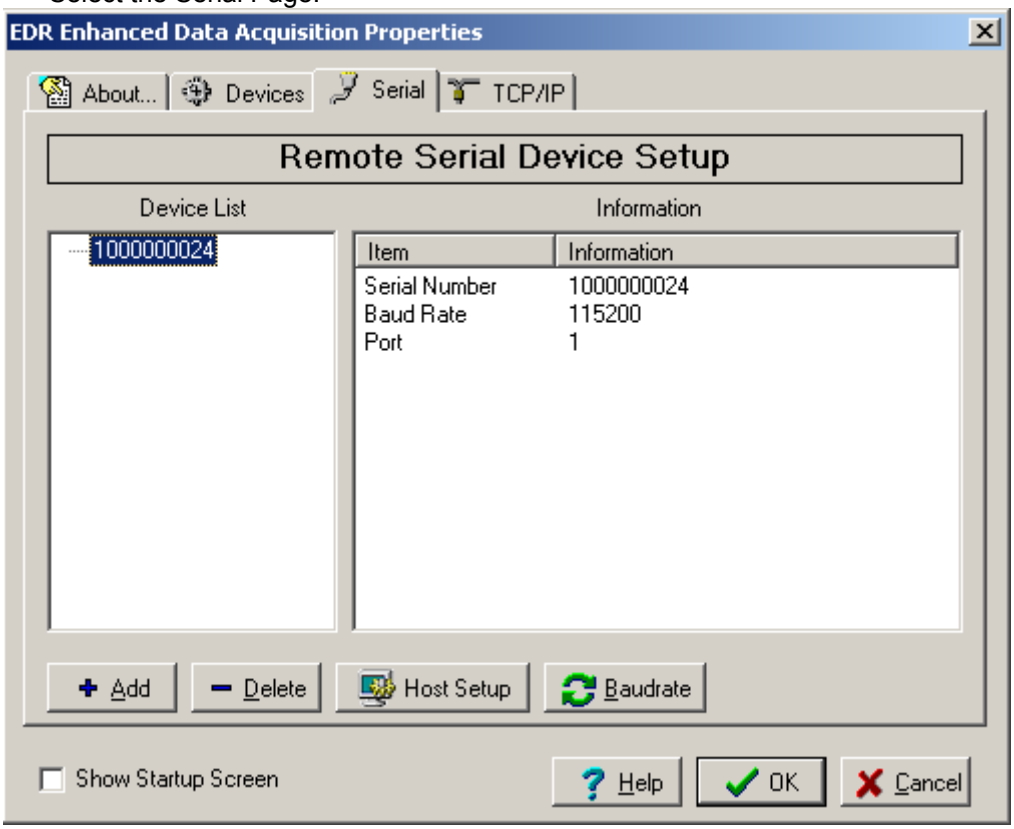

EDR Enhanced Data Acquisition Properties
About...
Devices
Serial
TCP/IP
Remote Serial Device Setup
Device List
Information
1000000024
Item
Information
Serial Number
Baud Rate
Port
Add
Delete
Host Setup
Baudrate
Show Startup Screen
Help
OK
Cancel

Select "OK"

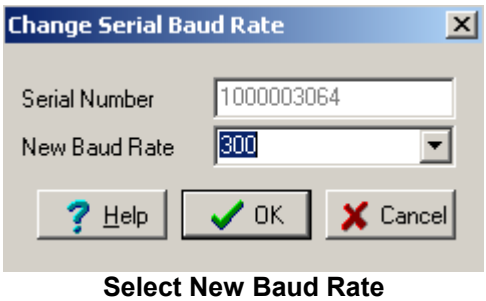
Baud Rate Setup

The default baud rate of the unit is 9600 baud. The device can be set to run at deferent baud rates.

- Open the ***"EDR Enhanced Setup"*** folder.
- Select the Serial Page.



Select "Baud Rate"



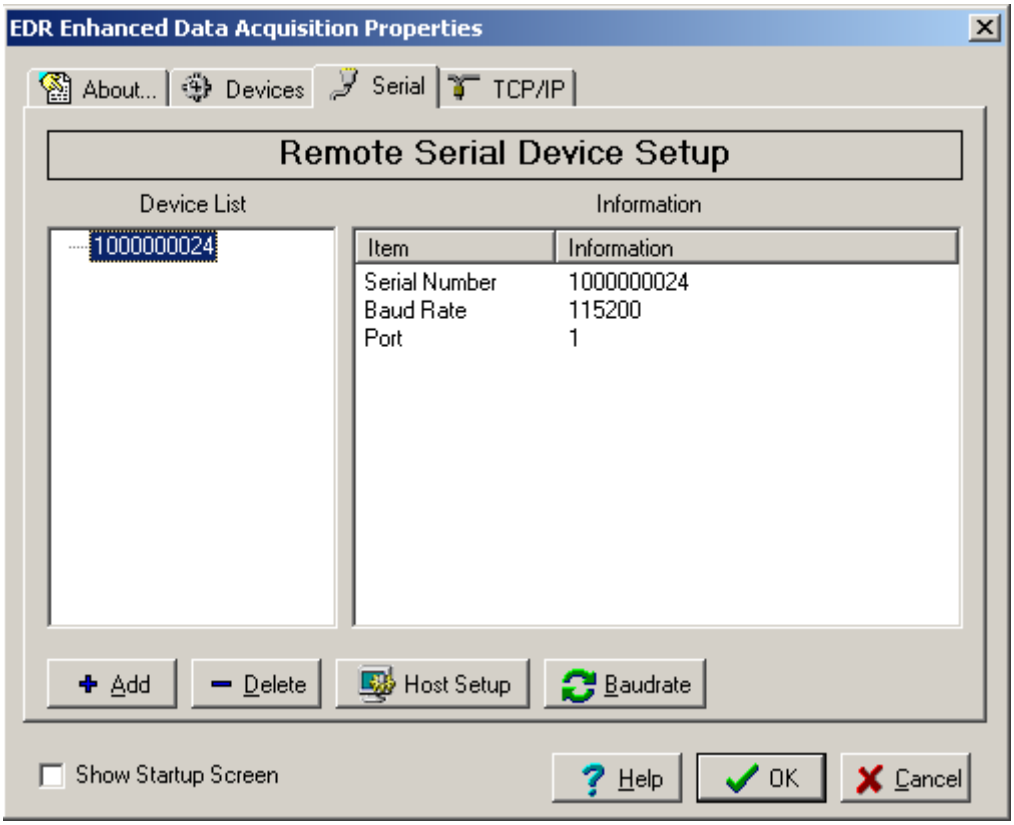
Select New Baud Rate
Select "OK"

- The new baud rate will take effect as soon as you exit the ***EDR Enhanced Setup.***

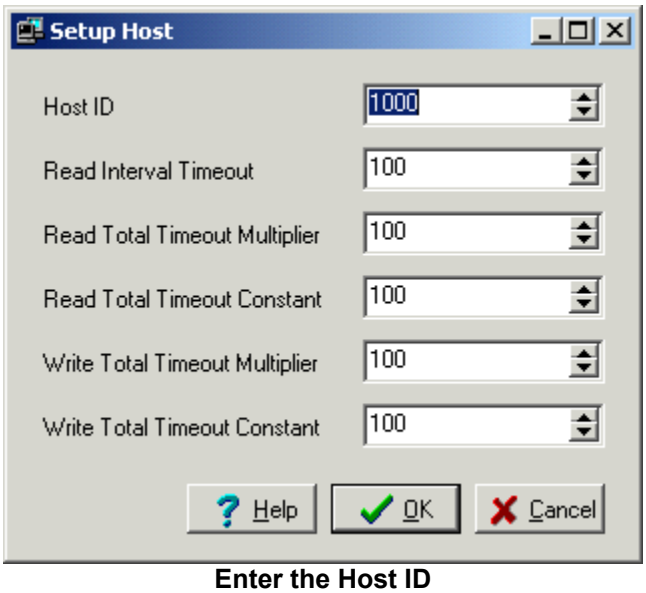
Host Setup

When more then one host computer is going to be used it is very important to set the **Host ID.**

- Open the ***"EDR Enhanced Setup"*** folder.
- Select the Serial Page.



Select "Host Setup"



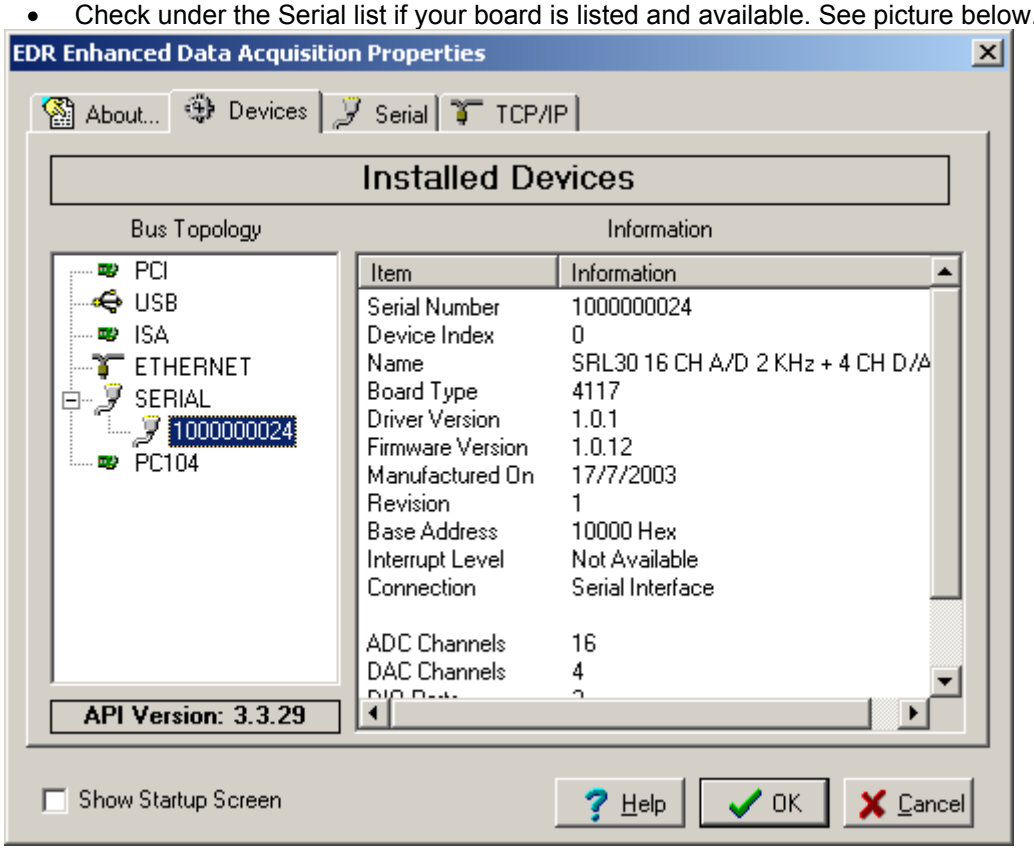
Enter the Host ID
Select "OK"

- Close EDR Enhanced Setup.

Post Setup

When done with the driver setup the ***"EDR Enhanced Setup"*** folder can be opened to check if the device setup was done successfully and if the device is available.

- First open the ***"EDR Enhanced Setup"*** folder.
- Select the Devices Page.
- Check under the Serial list if your board is listed and available. See picture below.



- If **"SRL Device Unavailable"** see Appendix C for troubleshooting.

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3. Interconnections

The SERIAL μDAQ series has connectors for digital I/O, counter-timers and analog I/O. The SERIAL μDAQ make use of only one adapter type; a DB25 male. To inter-connect there are some adapters available. A cable can be used to connect to a remote adapter or make use of a direct plug-in adapter.

External Connector and Accessories

The SERIAL μDAQ DIO is fitted with various connectors. The table below will show the application for each connector. As standard all SERIAL μDAQ DIO devices are fitted with DB-9 male connector and a DC power connector.

Device Type	DB25 (M) Digital I/O	DB25(M) Counters	DB25(M) Analog I/O
SRL 24A	1	0	0
SRL 24C	1	1	0
SRL 48A	2	0	0
SRL 48C	2	1	0
SRL 72A	3	0	0
SRL 72C	3	1	0
SRL 96A	4	0	0
SRL 96C	4	1	0
SRL 120A	5	0	0
SRL 26	1	0	1
SRL 30	1	0	1
SRL 73T/R8	1	0	1
SRL 73T/R16	1	0	2
SRL 73T/R32	1	0	4

Table 3-1 SERIAL μDAQ Connectors

Pin Assignments

SERIAL μDAQ RS232 – DB9 (M)

The table below shows the RS232 pin assignments for the DB9(M) connector.

Pin	Name	Pin	Name
1	NC	6	NC
2	RXD	7	NC
3	TXD	8	NC
4	NC	9	NC
5	DGND	10	DGND (shell)

Table 3-2 SERIAL μDAQ RS232 Connector – DB9 (M)

SERIAL μDAQ RS485 – DB9 (M)

The table below shows the RS485 pin assignments for the DB9(M) connector.

Pin	Name	Pin	Name
1	NC	6	NC
2	RXA	7	TXA
3	TXB	8	RXB
4	NC	9	NC
5	DGND	10	DGND (shell)

Table 3-3 SERIAL μDAQ RS485 Connector – DB9 (M)

SERIAL μDAQ DIO A/C – DB25 (M)

The table below shows the pin assignments for the DB25(M) digital I/O connectors found on the SERIAL μDAQ DIO A and C.

Pin	Name	Pin	Name
1	PA0	14	PA1
2	PA2	15	PA3
3	PA4	16	PA5
4	PA6	17	PA7
5	PB0	18	PB1
6	PB2	19	PB3
7	PB4	20	PB5
8	PB6	21	PB7
9	PC0	22	PC1
10	PC2	23	PC3
11	PC4	24	PC5
12	PC6	25	PC7
13	DGND		

Table 3-4 SERIAL μDAQ DIO Connector – DB25 (M)

SERIAL μDAQ CT – DB25 (M)

The table below shows the pin assignments for the DB25(M) counter timer connector found on the SERIAL μDAQ CT.

Pin	Name	Pin	Name
1	NC	14	NC
2	NC	15	OUT5
3	GATE_EXT5	16	CLK_EXT5
4	CLK_EXT0	17	OUT4
5	GATE_EXT0	18	OUT0
6	OUT2	19	CLK_EXT2
7	CLK_EXT1	20	GATE_EXT2
8	OUT1	21	GATE_EXT1
9	DGND	22	GATE_EXT4
10	NC	23	CLK_EXT4
11	NC	24	OUT3
12	NC	25	GATE_EXT3
13	CLK_EXT3		

Table 3-5 SERIAL μDAQ CT Connector – DB25 (M)

SERIAL μDAQ Analog I/O – DB25 (M)

The table below shows the pin assignments for the DB25(M) analog I/O connectors found on the SERIAL μDAQ Analog I/O.

Pin	Name	Pin	Name
1	ACH0	14	ACH1
2	ACH2	15	ACH3
3	ACH4	16	ACH5
4	ACH6	17	ACH7
5	ACH8	18	ACH9
6	ACH10	19	ACH11
7	ACH12	20	ACH13
8	ACH14	21	ACH15
9	AGND	22	DAC0
10	DAC1	23	DAC2
11	DAC3	24	10V_REFCAL
12	NC	25	EXT_TRIG
13	EXT_CLK	26	SHELL - DGND

Table 3-6 SERIAL μDAQ Analog I/O – DB25 (M)

SERIAL μDAQ Temperature Input – DB25 (M)

The table below shows the pin assignments for the DB25(M) temperature input connectors found on the SERIAL μDAQ Temperature device.

Pin	Name	Pin	Name
1	AGND	14	+8.4V
2	AGND	15	+12V
3	AGND	16	CJC
4	AGND	17	-12V
5	AGND	18	TCH7-
6	TCH7+	19	TCH6-
7	TCH6+	20	TCH5-
8	TCH5+	21	TCH4-
9	TCH4+	22	TCH3-
10	TCH3+	23	TCH2-
11	TCH2+	24	TCH1-
12	TCH1+	25	TCH0-
13	TCH0+	26	SHELL - DGND

Table 3-7 SERIAL μDAQ Temperature Input – DB25 (M)

Signal Definitions

This sections deal with all the signals abbreviations.

Signal	Description
PA0-7	8255 PPI Port A
PB0-7	8255 PPI Port B
PC0-7	8255 PPI Port C
GATE_EXT0-5	Counter External Gate
CLK_EXT0-5	Counter External Clock
OUT0-5	Counter Output
DGND	Digital ground.
AGND	Analog Ground
ACH0-15	Analog Input Channels 0 –15
TCH (0-)-(7-)	Thermo couple negative input
TCH (0+)-(7+)	Thermo couple positive input
DAC0-3	Analog Outputs Channels 0 – 3
EXT_CLK	External Clock
EXT_TRIG	External Trigger
10V_REFCAL	10 Volt Reference Calibration
RXD	Receive
TXD	Transmit
RXA	Receive A
RXB	Receive B
TXA	Transmit A
TXB	Transmit B
DGND	Digital ground.
NC	Not Connected

Table 3-8 Signal definitions

Pin Descriptions

Digital Inputs/Outputs (PA0-7, PB0-7, PC0-7)

These lines are connected to the 3 ports of the 8255 PPI. Each port can be configured as either an input or an output.

Digital Ground (DGND)

All digital ground signals should be connected to this pin.

External Gate (GATE_EXT)

These lines are used to externally control the gate of the counters.

External Clock (CLK_EXT)

These lines are used to externally clock the counters.

Output (Out)

These are the outputs of each counter-timer.

Digital Ground (DGND)

All digital ground signals should be connected to this pin.

Analog Ground (AGND)

All analog inputs should be referenced to AGND. Do not connect AGND and DGND together. This will create ground loops and instability in the hardware.

Analog Inputs (ACH0-15)

The analog input channels are connected to the analog input sub-system and are used to measure analog voltages. These signals are referenced to analog ground (AGND).

Analog Outputs (DAC0-3)

The analog output channels are used to output analog voltages. They are referenced to analog ground (AGND).

External Clock (EXT_CLK)

This pin is the external clock input. It is used to control the convert timing of the analog to digital converter. This signal is synchronized with a master clock of 20MHz. The signal must be referenced to digital ground (DGND), which is the connecter shell.

External Trigger (EXT_TRIG)

This signal is used as a control gate for the analog input scanning process. When selected by software and set high it will enable the process. A low voltage will disable the process.

10 Volt Reference Calibration 10V_REFCAL)

This pin is used to measure the 10-volt reference for the analog circuit. It is only used during calibration and should not be used externally. If used it can affect the performance of the analog I/O.

WARNING: Do not connect to the 10Volt Reference Pin.

Application Modules & Accessories

The USB devices support a wide range of standard applications modules. These application modules can help to simply or easily duplicate installation that can save allot of time. Application modules and accessories come in many forms. It has support for digital output control and digital input monitoring for AC and DC. Analog signal conditioners, analog amplifiers and optically isolation are also available.

Wiring Diagram

RS-232 Cable Diagram

The figure below shows the RS232 cable connections for the DB9(M) connector.

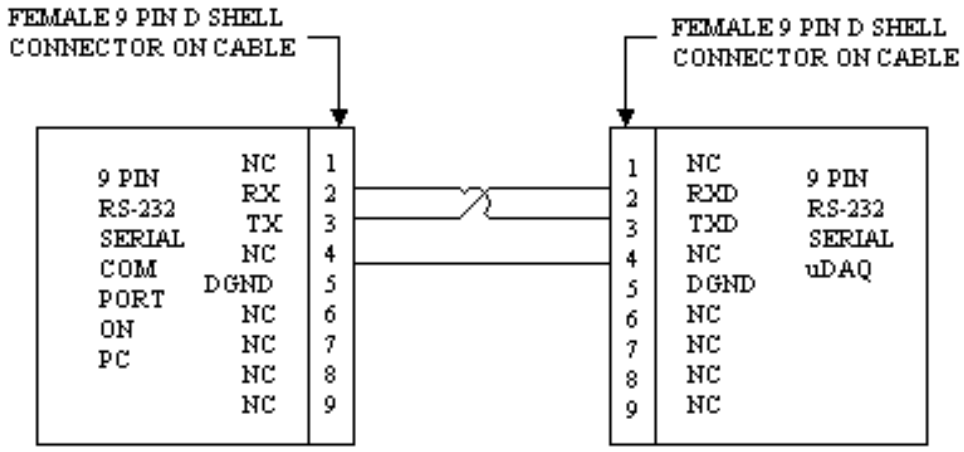


Figure 3-1 9-Pin to 9-Pin Cable Diagram

4. Programming Guide

The SERIAL μDAQ series is supplied with a complete software development kit. EDR Enhanced (EDRE SDK) comes with drivers for many operating systems and a common application program interface (API). The API also serves as a hardware abstraction layer (HAL) between the control application and the hardware. The EDRE API makes it possible to write an application that can be used on all hardware with common sub-systems.

EDR Enhanced API

The EDR Enhanced SDK comes with both ActiveX controls and a Windows DLL API. Examples are provided in many different languages and serve as tutorials. EDRE is also supplied with a software manual and user's guide.

The EDRE API hides the complexity of the hardware and makes it really easy to program the SERIAL μDAQ device. It has got functions for each basic sub-system and is real easy to learn.

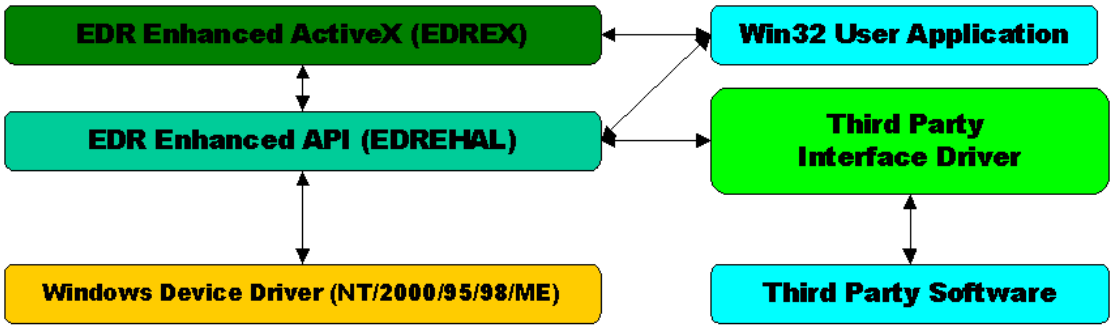


Figure 4-1 EDR Enhanced Design

Digital Inputs/Outputs

Depending on the version that you have the SERIAL μDAQ DIO device can have up to 120 digital lines. Please refer to your particular version for specific details.

Reading the Digital Inputs

A single call is necessary to read a digital I/O port.

API-CALL

Long EDRE_DioRead(ulng Sn, ulng Port, ulng *Value)

The serial number, port, and a pointer to variable to hold the result must be passed by the calling function. A return code will indicate if any errors occurred.

ACTIVEX CALL

Long EDREDioX.Read(long Port)

Only the port-number needs to be passed and the returned value will either hold an error or the value read. If the value is negative an error did occur.

Writing to the Digital Outputs

A single call is necessary to write to a digital I/O port.

API-CALL

Long EDRE_DioWrite(ulng Sn, ulng Port, ulng Value)

The serial number, port, and a value must be passed by the calling function. A return code will indicate if any errors occurred.

ACTIVEX CALL

Long EDREDioX.Write(long Port, long Value)

The port number and value to be written needs to be passed and the returned value holds an error or the value read. If the value is negative an error did occur.

Port	PPI No	Assigned Number	Width	Description
SRL 24A/CA				
A	0	0	8-bits	Port A
B	0	1	8-bits	Port B
C	0	2	8-bits	Port C
SRL 48A/C				
A	0	0	8-bits	Port A
B	0	1	8-bits	Port B
C	0	2	8-bits	Port C
A	1	3	8-bits	Port A
B	1	4	8-bits	Port B
C	1	5	8-bits	Port C
SRL 72A/C				
A	0	0	8-bits	Port A
B	0	1	8-bits	Port B
C	0	2	8-bits	Port C
A	1	3	8-bits	Port A
B	1	4	8-bits	Port B
C	1	5	8-bits	Port C
A	2	6	8-bits	Port A
B	2	7	8-bits	Port B
C	2	8	8-bits	Port C
SRL 96A/C				
A	0	0	8-bits	Port A
B	0	1	8-bits	Port B
C	0	2	8-bits	Port C
A	1	3	8-bits	Port A
B	1	4	8-bits	Port B
C	1	5	8-bits	Port C
A	2	6	8-bits	Port A
B	2	7	8-bits	Port B
C	2	8	8-bits	Port C
A	3	9	8-bits	Port A

B	3	10	8-bits	Port B
C	3	11	8-bits	Port C
SRL 120A				
A	0	0	8-bits	Port A
B	0	1	8-bits	Port B
C	0	2	8-bits	Port C
A	1	3	8-bits	Port A
B	1	4	8-bits	Port B
C	1	5	8-bits	Port C
A	2	6	8-bits	Port A
B	2	7	8-bits	Port B
C	2	8	8-bits	Port C
A	3	9	8-bits	Port A
B	3	10	8-bits	Port B
C	3	11	8-bits	Port C
A	4	12	8-bits	Port A
B	4	13	8-bits	Port B
C	4	14	8-bits	Port C
SRL 26/30				
A	0	0	8-bits	Port A
B	0	1	8-bits	Port B
C	0	2	8-bits	Port C
SRL 73R/T				
A	0	0	8-bits	Port A
B	0	1	8-bits	Port B
C	0	2	8-bits	Port C

Table 4-1 SERIAL μDAQ DIO Port Assignments

Counters

The counter sub-system is supported by functions to Write, Read, Configure and controlling the gate. There are 6 counters. Counter-timers are only supported by the SRL24C, SRL 48C, SRL 72C and SRL 96C. The table below shows the relation of the counters and their software assigned numbers.

Counter	Assigned Number	Description
CT0	0	Counter 0
CT1	1	Counter 1
CT2	2	Counter 2
CT3	3	Counter 3
CT4	4	Counter 4
CT5	5	Counter 5

Table 4-2 Counter Assignment

Label1

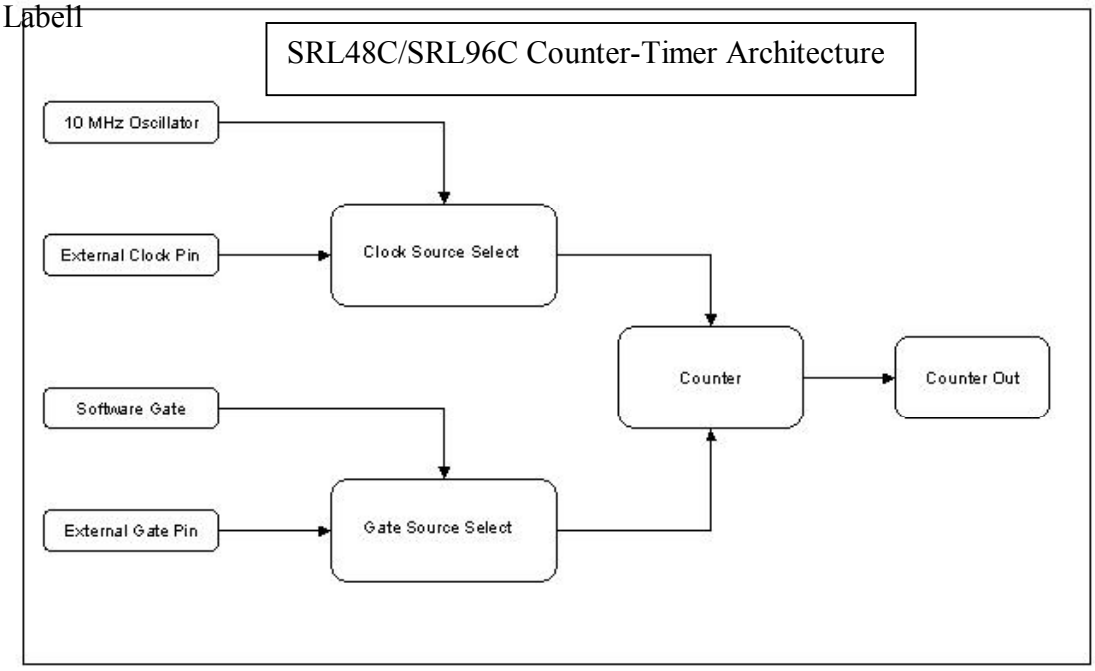


Figure 4-2 Counter-Timer Architecture

Writing the initial counter value

A single call is necessary to write a counter's initial load value.

API-CALL
Long EDRE_CTWrite(ulng Sn, ulng Ct, ulng Value)
The serial number, counter-number, and a value must be passed by the calling function. A return code will indicate if any errors occurred.

ACTIVEX CALL
Long EDRECTX.Write(long Port, ulng Value)
The counter-number and a value must be passed by the calling function. A return code will indicate if any errors occurred.

Reading the counter value

A single call is necessary to read a counter.

API-CALL
Long EDRE_CTRead(ulng Sn, ulng Ct, pulng Value)
The serial number, counter-number, and a reference parameter must be passed by the calling function. A return code will indicate if any errors occurred.

ACTIVEX CALL
Long EDRECTX.Read(long Port)
The counter number must be passed by the calling function. If the return code is negative it means an error occurred, otherwise it will be the value read from the counter.

Counter	Assigned Number	Resolution
CT0	0	16-bits
CT1	1	16-bits
CT2	2	16-bits
CT3	3	16-bits
CT4	4	16-bits
CT5	5	16-bits

Table 4-3 Counter Resolution

Configuring a counter

A single call is necessary to configure a counter.

API-CALL
Long EDRE_CTConfig(ulng Sn, ulng Ct, ulng Mode, ulng Type, ulng ClkSrc, ulng GateSrc)
The serial number, counter-number, mode, type, clock source and gate source is needed to specify a counter's configuration. A return code will indicate if any errors occurred.

ACTIVEX CALL
Long EDRECTX.Configure(long ct, long mode, long type, ulng source, ulng gate)
The counter-number, mode, type, clock source and gate source is needed to specify a counter's configuration. A return code will indicate if any errors occurred.

The table below shows the options for each parameter.

Parameter	Description
Sn	Serial Number
Ct	Counter Number: 0 : Counter 0 1 : Counter 1 2 : Counter 2 3 : Counter 3 4 : Counter 4 5 : Counter 5
Mode	82c54 Mode See 82c54 datasheet
Type	Interrupt on TC: 0 : Disabled 1 : Enabled This bit will only generate a interrupt at the interrupt sub-system. The interrupt sub-system must also be setup to generate a interrupt.
Source	0 : Internal (10MHz) 1 : External (External connector)
Gate	0 : Internal 1 : External (External connector)

Table 4-4 Counter Configuration

Controlling the counter gate

A single call is necessary to control a counter's gate.

API-CALL
Long EDRE_CTSoftGate(ulng Sn, ulng Ct, ulng Gate)
The serial number, counter-number and gate are needed to control a counter's gate. A return code will indicate if any errors occurred.

ACTIVEX CALL

Long EDRECTX.SoftGate(ulng Ct, ulng Gate)
The counter-number and mode is needed to control a counter's gate. A return code will indicate if any errors occurred.

These values are acceptable as a gate source.

Value	Description
0	Gate disabled
1	Gate enabled

Table 4-5 Gate Configuration

Programming Interrupts

The interrupt sub-system is totally programmable and includes functions to configure, enable and disable interrupts.

Configuring the Interrupt sub-system

A single call is necessary to configure the interrupt sub-system.
API-CALL
Long EDREIntX.IntConfigure(long Source, long Mode, long Type)

Parameter	Type	Description
Source	long	0 Counter 0 1 Counter 1 2 Counter 2 3 Counter 3 4 Counter 4 5 Counter 5
Mode	long	Disable or Enable a source 0 : Disable 1 : Enable
Type	long	Set the type of trigger for the interrupt No Description 0 Rising Edge 1 Falling Edge
RETURN	Long	This parameter contains the error code return. If =0 then no error occurred.

Table 4-6 EDREIntX.Configure Parameters

Enabling Interrupts

A single call is necessary to enable the interrupt sub-system.
ACTIVEX-CALL
Long EDREIntX.Enable
A returned error code will contain the status of the call.

Disabling Interrupts

A single call is necessary to disable the interrupt sub-system.
ACTIVEX-CALL
Long EDREIntX.Disable
A returned error code will contain the status of the call.

Interrupt Event

If interrupts are enabled an event will occur on each interrupt. The interrupt control's interrupt event will be triggered. The source of the interrupt will also be passed to the event handler.

Analog Output – SRL 30

The SRL 30 has 4 x 14-bit analog output channels with a range of ±10 volt. These channels are very easy to program. A single command is used to write to them.

Writing to a DAC channel

A single call is necessary to set a voltage on a DAC channel. The table below shows the relation between the software channel and the channel on the connector.

Assigned Software Channel	Assigned Connector Pin
0	DAC0
1	DAC1
2	DAC2
3	DAC3

Table 4-7 Assigned DAC Channels

API-CALL
Long EDRE_DAWrite (ulng Sn, ulng Channel, long uVoltage)
The serial number, DAC channel and micro-voltage is needed to set a DAC channel's voltage. A return code will indicate if any errors occurred.

ACTIVEX CALL
Long EDREDAX.Write (ulng Channel, long uVoltage)
The DAC channel and micro-voltage is needed to set a DAC channel's voltage. A return code will indicate if any errors occurred.

Analog Input – SRL 26, SRL 30

The SRL 26/30 has a very flexible analog input sub-system. Configuration includes dynamic range, gain, reference and differential or single ended inputs. Each of these settings can be applied to an individual channel while scanning.

The analog inputs can operate in two modes, single read or scanning. Only one mode can be used at a single moment. The table below shows the relation between the software assigned channels and the connector.

Assigned Software Channel	Input Type	Input Pin	Reference Pin
0	Single	ACH0	AGND
…	…	…	…
15	Single	ACH15	AGND
0	Differential	ACH0	ACH8
…	…	…	…
7	Differential	ACH7	ACH15

Table 4-8 Assigned Analog Input Channels

Reading a single voltage from a channel

To read a single ADC channel you need to specify the channel, voltage range and gain.

API-CALL

Long EDRE_ADSingle (ulng Sn, ulng Channel, ulng Gain, ulng Range, plong uVoltage)

Parameter	Type	Description
Sn	Unsigned long	Device serial number
Channel	Unsigned long	ADC channel to read
Gain	Unsigned long	Gain Codes
Range	Unsigned long	Range Codes
uVoltage	Pointer to long	Returned micro voltage
Return	long	Error code

Gain Codes

Value	Gain
0	X ¼
1	X ½
2	X 1
3	X 2.5
4	X 5
5	X 10
6	X 25
7	X 50
8	X 100

Range Codes

Value	Range
0	UNIPOLAR, SINGLE ENDED
1	BIPOLAR, SINGLE ENDED
2	UNIPOLAR, DIFFERENTIAL
3	BIPOLAR, DIFFERENTIAL

ACTIVEX CALL

Long EDREADX.SingleRead (long Channel)

Make sure to set the *Gain* and *Range* properties of the ADC ActiveX control. This will in turn set the range and gain when reading the ADC channel.

Configuring the ADC subsystem for scanning

This is the most complicated part of configuring the SRL 26/30 for auto scanning. Make sure that you use the correct format when applying the channel list configuration. There are many loopholes and care should be taken when implementing code to configure the SRL 26/30.

API-CALL

Long EDRE_ADConfig (ulng Sn, pulng Freq, ulng ClkSrc, ulng Burst, ulng Range, pulng ChanList, pulng GainList, ulng ListSize)

The following parameters must be specified when configuring the ADC sub-system.

<table>
<tr><th>Parameter</th><th>Type</th><th>Description</th></tr>
<tr><td>Sn</td><td>Unsigned long</td><td>Device serial number</td></tr>
<tr><td>Frequency</td><td>Pointer to an unsigned long</td><td>ADC Sampling frequency</td></tr>
<tr><td>ClkSrc</td><td>Unsigned long</td><td>This parameter is used to configure the clock/convert source of the ADC sub-system.
<table>
<tr><th>Offset (bits)</th><th>Description</th></tr>
<tr><td>0</td><td>Clock Source (C0-C7)
0: Internal 10 MHz clock
1: External Convert (EXT_CLK)</td></tr>
<tr><td>8</td><td>Gate Source (G0-G7)
0: Disable
1: External Gate (EXT_TRIG)</td></tr>
</table>
Example Layout:
<table>
<tr><th>15</th><th>14</th><th>13</th><th>12</th><th>11</th><th>10</th><th>9</th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>G7</td><td>G6</td><td>G5</td><td>G4</td><td>G3</td><td>G2</td><td>G1</td><td>G0</td><td>C7</td><td>C6</td><td>C5</td><td>C4</td><td>C3</td><td>C2</td><td>C1</td><td>C0</td></tr>
</table></td></tr>
<tr><td>Burst</td><td>Unsigned long</td><td>Not Used</td></tr>
<tr><td>Range</td><td>Unsigned long</td><td>Not used</td></tr>
<tr><td>ChanList</td><td>Pointer to an unsigned long</td><td>This is a pointer to an array that contains the list of channels to be scanned. The array length should be the same length as the value of ListSize</td></tr>
<tr><td>GainList</td><td>Pointer to an unsigned long</td><td>GainList is an array that contains the gain/range settings for each channel in the scan list. The array length should the same as the ListSize value.
<table>
<tr><th>Offset (bits)</th><th>Description</th></tr>
<tr><td>0</td><td>Specifies the gain of the channel.(G)
<table>
<tr><th>Value</th><th>Gain</th></tr>
<tr><td>0</td><td>X ¼</td></tr>
<tr><td>1</td><td>X ½</td></tr>
<tr><td>2</td><td>X 1</td></tr>
<tr><td>3</td><td>X 2.5</td></tr>
<tr><td>4</td><td>X 5</td></tr>
<tr><td>5</td><td>X 10</td></tr>
<tr><td>6</td><td>X 25</td></tr>
<tr><td>7</td><td>X 50</td></tr>
<tr><td>8</td><td>X 100</td></tr>
</table></td></tr>
<tr><td>8</td><td>Specifies the range of the channel. (R)
<table>
<tr><th>Value</th><th>Range</th></tr>
<tr><td>0</td><td>UNIPOLAR, SINGLE ENDED</td></tr>
<tr><td>1</td><td>BIPOLAR, SINGLE ENDED</td></tr>
<tr><td>2</td><td>UNIPOLAR, DIFFERENTIAL</td></tr>
<tr><td>3</td><td>BIPOLAR, DIFFERENTIAL</td></tr>
</table></td></tr>
</table>
Example Layout:
<table>
<tr><th>15</th><th>14</th><th>13</th><th>12</th><th>11</th><th>10</th><th>9</th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>R7</td><td>R6</td><td>R5</td><td>R4</td><td>R3</td><td>R2</td><td>R1</td><td>R0</td><td>G7</td><td>G6</td><td>G5</td><td>G4</td><td>G3</td><td>G2</td><td>G1</td><td>G0</td></tr>
</table></td></tr>
<tr><td>ListSize</td><td>unsigned long</td><td>This is the length of the channel list.</td></tr>
<tr><td>Return</td><td>long</td><td>Error code</td></tr>
</table>

ACTIVEX CALL

Long EDREADX.Configure (plong Channels, plong Gains, long ListSize)

The *Frequency* and *ClockSource* ADC ActiveX control must be setup before calling the configure function. See the above table for the layout of the Channels and Gains lists.

EDREADX.Frequency
This is the sampling frequency of the ADC process. This parameter must be set before calling the Configure method. After calling the Configure method the Frequency property will be set to the actual sampling frequency.

WARNING!!

- On the SRL 26/30 the frequency is the update rate of the A/D converter. This means that the board will convert the channels at a period of equal to the frequency and the channels in the sequence of the channel list. The end result is that the time between samples is equal to 1/Frequency.

EDREADX.ClockSource
The clock source property is used to specify the clock settings for the ADC process.

Offset (bits)	Description
0	Clock Source (C0-C7) 0: Internal 10 MHz clock 1: External Convert (EXT_CLK)
8	Gate Source (G0-G7) 0: Disable 1: External Gate (EXT_TRIG)

Example Layout

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
G7	G6	G5	G4	G3	G2	G1	G0	C7	C6	C5	C4	C3	C2	C1	C0

Starting and Stopping the ADC process

A single call is necessary to start or stop the ADC process

API-CALL
Long EDRE_ADStart (ulng Sn)
A serial number needs to be specified to start the ADC process. A returned error code will indicate if the function succeeded.

ACTIVEX CALL
Long EDREADX.Start ()
A call to the start method will start the ADC process of the device too which the ActiveX control is linked. A returned error code will indicate if the function succeeded.

API-CALL
Long EDRE_ADStop (ulng Sn)
A serial number needs to be specified to stop an ADC process. A returned error code will indicate if the function succeeded.

ACTIVEX CALL
Long EDREADX.Stop ()
A call to the start method will stop the ADC process of the device too which the ActiveX control is linked. A returned error code will indicate if the function succeeded.

Driver buffer functions

A single call is necessary copy data from the driver buffer to an user buffer. The driver-buffer is a large circular buffer that can hold data for a period of time running at full speed. This buffer needs to be emptied regularly to make sure it does not overrun. The buffer can be

queried with number of samples available and other status issues as well. There are two functions available to copy data, one for copying voltages, another to copy the raw data. The raw data is significantly faster as for the data does not have to be converted to voltages before copying it to the user buffer. The raw data also occupies less space than the micro voltage buffer. There are also functions to write data to disk as the user buffer get copied. Refer to the EDR Enhanced programming manual for a reference to these functions.

API-CALL
Long EDRE_ADGetData (ulng Sn, plong Buf, pulng BufSize)
ACTIVEX CALL
Long EDREADX.GetData (plong Buffer, plong Size)
To retrieve data from the driver buffer the serial number need to be supplied, a buffer to hold the data and the size of the buffer or requested number of samples. The driver will only copy the number of available samples in multiple of the channel list. For the ActiveX call only the buffer and size need to be supplied.

Querying the ADC subsystem

The driver can be queried to check the status of the ADC subsystem. The number of unread samples is one example. The appendix has a list of all possible query codes.

API-CALL
Long EDRE_Query (ulng Sn, ulng QueryCode, ulng Param)
A serial number, query code and parameter must be specified when doing a query.

ACTIVEX CALL
Long EDREADX.GetUnread ()
This function automatically queries the ADC driver buffer for the number of available samples.

Change Baud Rate

A single Query call is necessary to change the baud rate of the serial device.
The Query Code must be “SETBAUDRATE” (701) to change the baud rate. The Parameter must specify the new baud rate. **See Baud Rate** Codes table.

API-CALL
Long EDRE_Query(ulng Sn, ulng code, ulng Param)
The serial number, Query Code and Parameter must be passed by the calling function.

ACTIVEX CALL
Long EDREUtlX.Query(long code, long Param)

The Query Code and Parameter must be passed by the calling function.

Temperature Input

The SRL 73T-8/16/32 has a basic 8 differential channel configuration (See table 3-7), accessible via a DB25M connector. The channels on one of these DB25M connectors will be referred to as a channels set. Each SRL 73 is supplied with a set of μDAQ TEMP T/C ADAPTERS.

Temperature measurements can be done with as little as four lines of code.

Reading CJC Channel

Each channels set has a CJC channel. The CJC channels is use in software when calculating the temperature for Cold Junction Compensation, hence CJC. Each of the μDAQ TEMP T/C ADAPTERS has a circuit that will supply a voltage of 10mVolt per 1 degree C. Reading the CJC channel is as easy as reading an analog channel. Each of the CJC channel is allocated a channel number witch are always the last channels of any device.
E.g. if your device has two CJC channels and 34 analog channels, channel 0-31 will be analog inputs and channels 32 and 33 will be the CJC channels.

The table shows the normal CJC assignment for the SRL 73.

Device	CJC Channels	
SRL 73T-8	CJC	Value Assigned
	0	8
SRL 73T-16	CJC	Value Assigned
	0	16
	1	17
SRL 73T-32	CJC	Value Assigned
	0	32
	1	33
	2	34
	3	35

Table 4-9 CJC Channels Assigned

The value that is assigned to a CJC channel can be queried with software as well.

API-CALL
Long EDRE_Query (ulng Sn, ulng Code, long Param)
Serial number, Query code *ADAMBCHAN or 141* and the param that represent the CJC channel 0-3. A return code will indicate the channel assigned or if any errors occurred.

ACTIVEX CALL
Long EDREUtlX.Query (ulng Channel, long uVoltage)
Query code *ADAMBCHAN or 141* and the param that represent the CJC channel 0-3. A return code will indicate the channel assigned or if any errors occurred.

Reading the CJC channel

API-CALL
Long EDRE_ADSingle (ulng Sn, ulng Channel, ulng Gain, ulng Range, plong uVoltage)

Parameter	Type	Description
Sn	Unsigned long	Device serial number
Channel	Unsigned long	Assigned Channel
Gain	Unsigned long	NULL
Range	Unsigned long	NULL
uVoltage	Pointer to long	Returned micro voltage
Return	long	Error code

ACTIVEX CALL
Long EDREADX.SingleRead (long Channel)
Only the assigned channel value is needed. A return code will indicate the voltage in microvolt.

Read Thermo Couple Channel

Reading the thermocouple channel is the same as reading the CJC channels. The thermo couple channels for the SRL 73 will always start at channel 0. For a device with both normal ADC channels and Temperature channels the channels value assigned to the temperature channels will start after the normal ADC channels.

API-CALL
Long EDRE_ADSingle (ulng Sn, ulng Channel, ulng Gain, ulng Range, plong uVoltage)

Parameter	Type	Description
Sn	Unsigned long	Device serial number
Channel	Unsigned long	Assigned Channel
Gain	Unsigned long	NULL
Range	Unsigned long	NULL
uVoltage	Pointer to long	Returned micro voltage
Return	Long	Error code

ACTIVEX CALL
Long EDREADX.SingleRead (long Channel)
Only the assigned channel value is needed. A return code will indicate the voltage in microvolt.

Calculating Ambient Temperature

API-CALL
Long EDRE_CalcCJCmC(long cjcuv)

ACTIVEX CALL
Long EDREADX.CalcCJCmC(long cjcuv)

Parameter	Type	Description
cjcuv	Long	CJCTemp channel uVolts
Return	Long	Milli Degrees Celsius

Calculating Temperature for Thermocouples

API-CALL
Long EDRE_CalcTCmC(long tctype, long tcuv, long ambientmc)

ACTIVEX CALL
Long EDREADX.CalcTCmC(long tctype, long tcuv, long ambientmc)

Parameter	Type	Description
tctype	Long	Type Thermocouple used. (See appendix for details)
tcuv	Long	Voltage read from channel uVolts
ambientmc	Long	Ambient temperature mille Degrees
Return	Long	Milli Degrees Celsius

Calibration - SRL 26/30

If the SERIAL device needs to be calibrated, the software can be found on the EDR Enhanced SDK CD-Rom. This application provides step-by-step information of how to calibrate your device. Make sure that you have a high precision multimeter and calibration voltage source. This will help to configure your device more accurately.

Calibration Procedure – SRL 26/30

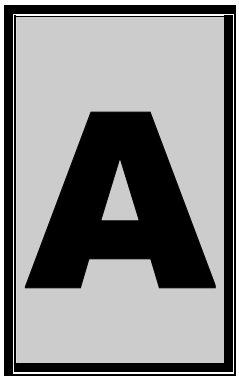
1. Install the USB Calibration Software <EDRECD>\EDRE\APPS\USB-30 CAL
2. Run the USB Calibration Software.
3. Follow the step-by-step information on screen to tune your device.
4. Make sure to save the data to your device.

Calibration - SRL 73

If the SERIAL device needs to be calibrated, the software can be found on the EDR Enhanced SDK CD-Rom. This application provides step-by-step information of how to calibrate your device. Make sure that you have a high precision calibration voltage source. This will help to configure your device more accurately.

Calibration Procedure – SRL 73

1. Install the USB Calibration Software <EDRECD>\EDRE\APPS\USB-73 CAL
2. Run the USB Calibration Software.
3. Follow the step-by-step information on screen to tune your device.
4. Make sure to save the data to your device.



A.Specifications

Digital Input/Output Characteristics

Number of Digital Channels:

Device	Channels
SRL 24A	24
SRL 24C	24
SRL 48A	48
SRL 48C	48
SRL 72A	72
SRL 72C	72
SRL 96A	96
SRL 96C	96
SRL 120A	120
SRL 26	24
SRL 30	24
SRL 73	24

Number of Grouped Channels:

Device	PPI Channels
SRL 24A	3
SRL 24C	3
SRL 48A	6
SRL 48C	6
SRL 72A	9
SRL 72C	9
SRL 96A	12
SRL 96C	12
SRL 120A	15
SRL 26	3
SRL 30	3
SRL 73	3

Compatibility: TTL

D.C Characteristics – PPI 8255 Compatible Ports

Level	Min	Max
Input Low Voltage	-0.5V	0.8V
Input High Voltage	2.0V	5.0V
Output High Voltage	2.4V	
Output Low Voltage		0.45V
Output Current		2mA

Counter-Timer Characteristics

Number of Counter-Timer Channels:

Device	Channels
SRL 24A	0
SRL 24C	6
SRL 48A	0
SRL 48C	6
SRL 72A	0
SRL 72C	6
SRL 96A	0
SRL 96C	6
SRL 120A	0
SRL 26	0
SRL 30	0
SRL 73	0

Resolution: 16-bits

Compatibility 82C54 / TTL

Clock Source

Software Selectable
1. Internal 10 MHz
2. External

Gate Source

Software Selectable
1. Software Controlled
2. External

Interrupt Source 6 x Terminal Count (TC).

I/O Characteristics

Level	Min	Max
Input Low Voltage	0V	0.8V
Input High Voltage	2.0V	5.25V
Low Level Input Current		- 100 uA
High Level Input Current		100 uA
Output High Voltage	2.4V	
Output Low Voltage		0.6V
Low Level Output Current		-24 mA
High Level Output Current		4 mA

Analog Output Characteristics (SRL 30)

Number of Channels:	4
Resolution:	14-bits
Maximum Update Rate	2 milliseconds
Data Transfer	Programmed I/O
Full Scale Error	±1 LSB (1.220 millivolts)
Zero Offset Error	±1/4 LSB (0.306 millivolts)
Output Drive	±5 milliamp
Load Characteristics	2KΩ || 10 nF
Power On State	0 Volt

Analog Input Characteristics (SRL 26/30)

Input Characteristics

Number of Channels
16 Single Ended
8 Differential

Resolution
14-bits

Maximum Update Rate
3 KS/s

Maximum Baud Rate
SRL full speed isochroous transfers @ 115200 Baud

Minimum Streaming Baud Rate
9600 Baud

Maximum Update @ different baud rates

Baud Rate	Max Update Samples per second
9600	200
19200	400
28800	600
38400	800
57600	1 200
115200	3 000

Input Programmable Ranges

Channel Gain	Unipolar Range	Bipolar Range
0.25	0-10V	±10V
0.50	0-10V	± 5V
1.00	0-5V	± 2.5V
2.50	0-2V	± 1V
5.00	0-1V	± 500 mV
10.00	0-500mV	± 250 mV
25.00	0-200mV	±100 mV
50.00	0-100mV	± 50 mV
100.00	0-50mV	± 25 mV

Input Coupling
DC

Maximum Working Voltage
±10V relative to analog ground

Over voltage protection
Power On State: -25V to +40V
Power Off State: -40V to +55V

Maximum Channel List Size
16

Conversion Characteristics

Maximum Conversion Rate
3 000 Samples per second

Converter Type
Successive approximation

Resolution
14-bits

Relative Accuracy
±1 LSB

Gain x 1 Offset Error
±0.4 mill volts

Gain x 10 Offset Error
±0.6 mill volts

Gain x 100 Offset Error
±0.1 mill volts

Scale x 1/4 Offset Error
± 1 mill volts

Scale x 1/2 Offset Error
±0.5 mill volts

Scale x 1 Offset Error
0 mill volts

External Clock – EXT_CLK pin

Maximum Rate	3 000 Hz
Synchronization	Internal 20 MHz clock
Conversion	Falling Edge

External Gate – EXT_GATE pin

Enable Process	High Input (>2.4V DC)
Disabled Process	Low Input (<1.2V DC)

Thermo Couple Input Characteristics

Number of Channels

Device	Differential Channels
SRL-73T-8	8
SRL 73T-16	16
SRL 73T-32	32

Resolution 14-bits

Maximum Update Rate 2 milliseconds

Data Transfer Programmed I/O

Input Programmable Ranges

Channel Gain	Bipolar Range
30	±83mV

Input Coupling DC

Relative Accuracy ±1 LSB

Gain x 30 Offset Error ±0.011 millivolts

Interface

Communication Type	UART Compatible.
Communication Protocol	RS232 Or RS485
Baud Rate	300 Baud 1200 Baud 2400 Baud 4800 Baud 9600 Baud 19200 Baud 28800 Baud 38400 Baud 57600 Baud 115200 Baud

Power Requirements

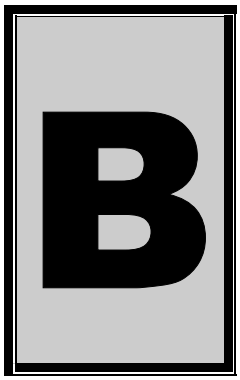
Specification	**SRL 24A/C**	**SRL 48A/C**	**SRL 72A/C**	**SRL 96A/C**	**SRL 120A/C**
Power Supply	1A	1A	1A	1A	1A

Environmental / Physical

Relative Humidity	0% to 90% (non-condensing)
Operating Temperature	0°C to 70°C
Housing	Plastic Casing
Dimension – 2 Tier Box	Height: 45mm Width: 80mm Length: 148mm

Connectors

SRL 24A	DB25 (M)
SRL 24C	2 x DB25 (M)
SRL 48A	2 x DB25 (M)
SRL 48C	3 x DB25 (M)
SRL 72A	3 x DB25 (M)
SRL 72C	4 x DB25 (M)
SRL 96A	4 x DB25 (M)
SRL 96C	5 x DB25 (M)
SRL 120A	5 x DB25 (M)
SRL 26	2 x DB25 (M)
SRL 30	2 x DB25 (M)
SRL 73T-8	2 x DB25 (M)
SRL 73T-16	3 x DB25 (M)
SRL 73T-32	5 x DB25 (M)



B.Configuration Constants

Query Codes

Name	Value	Description
APIMAJOR	1	Query EDRE API major version number.
APIMINOR	2	Query EDRE API minor version number.
APIBUILD	3	Query EDRE API build version number.
APIOS	4	Query EDRE API OS type.
APINUMDEV	5	Query number of devices installed.
BRDTYPE	10	Query a board's type.
BRDREV	11	Query a board's revision.
BRDYEAR	12	Query a board's manufactured year.
BRDMONTH	13	Query a board's manufactured month.
BRDDAY	14	Query a board's manufactured day.
BRDSERIALNO	15	Query a board's serial number.
DRVMAJOR	20	Query a driver's major version number.
DRVMINOR	21	Query a driver's minor version number.
DRVBUILD	22	Query a driver's build version number.
ADNUMCHAN	100	Query number of ADC channel.
ADNUMSH	101	Query number of samples-and-hold channels.
ADMAXFREQ	102	Query maximum sampling frequency.
ADBUSY	103	Check if ADC system is busy.
ADFIFOSIZE	104	Get ADC hardware FIFO size.
ADFIFOOVER	105	Check for FIFO overrun condition.
ADBUFFSIZE	106	Check software buffer size.
ADBUFFOVER	107	Check for circular buffer overrun.
ADBUFFALLOC	108	Check if software buffer is allocated.
ADUNREAD	109	Get number of samples available.
ADEXTCLK	110	Get status of external clock line – PCI30FG.
ADEXTTRIG	111	Get status of external trigger line – PCI30FG.
ADBURST	112	Check if burst mode is enabled.
ADRANGE	113	Get ADC range.
ADNUMTMP	140	Number of temperature channels
ADAMBCHAN	141	Get Ambient Channel
DANUMCHAN	200	Query number of DAC channels.
DAMAXFREQ	201	Query maximum DAC output frequency.
DABUSY	202	Check if DAC system is busy.
DAFIFOSZ	203	Get DAC FIFO size.
CTNUM	300	Query number of counter-timer channels.
CTBUSY	301	Check if counter-timer system is busy.
DIONUMPORT	400	Query number of digital I/O ports.
DIOQRYPORT	401	Query a specific port for capabilities.
DIOPORTWIDTH	402	Get a specific port's width.
INTNUMSRC	500	Query number of interrupts sources.
INTSTATUS	501	Queries interrupt system's status.
INTBUSCONNECT	502	Connect interrupt system to bus.
INTISAVAILABLE	503	Check if an interrupt is available.
INTNUMTRIG	504	Check number times interrupted
SRLGETBAUD	700	Query the baud rate of the serial device
SRLSETBAUD	701	Change baud rate of the serial device

Error Codes

Name	Value	Description
EDRE_OK	0	Function successfully.
EDRE_FAIL	-1	Function call failed.
EDRE_BAD_FN	-2	Invalid function call.
EDRE_BAD_SN	-3	Invalid serial number.
EDRE_BAD_DEVICE	-4	Invalid device.
EDRE_BAD_OS	-5	Function not supported by operating system.
EDRE_EVENT_FAILED	-6	Wait on event failed.
EDRE_EVENT_TIMEOUT	-7	Event timed out.
EDRE_INT_SET	-8	Interrupt in use.
EDRE_DA_BAD_RANGE	-9	DAC value out of range.
EDRE_AD_BAD_CHANLIST	-10	Channel list size out of range.
EDRE_BAD_FREQUECY	-11	Frequency out of range.
EDRE_BAD_BUFFER_SIZE	-12	Data passed by buffer incorrectly sized
EDRE_BAD_PORT	-13	Port value out of range.
EDRE_BAD_PARAMETER	-14	Invalid parameter value specified.
EDRE_BUSY	-15	System busy.
EDRE_IO_FAIL	-16	IO call failed.
EDRE_BAD_ADGAIN	-17	ADC-gain out of range.
EDRE_BAD_QUERY	-18	Query value not supported.
EDRE_BAD_CHAN	-19	Channel number out of range.
EDRE_BAD_VALUE	-20	Configuration value specified out of range.
EDRE_BAD_CT	-21	Counter-timer channel out of range.
EDRE_BAD_CHANLIST	-22	Channel list invalid.
EDRE_BAD_CONFIG	-23	Configuration invalid.
EDRE_BAD_MODE	-24	Mode not valid.
EDRE_HW_ERROR	-25	Hardware error occurred.
EDRE_HW_BUSY	-26	Hardware busy.
EDRE_BAD_BUFFER	-27	Buffer invalid.
EDRE_REG_ERROR	-28	Registry error occurred.
EDRE_OUT_RES	-29	Out of resources.
EDRE_IO_PENDING	-30	Waiting on I/O completion

Digital I/O Codes

Name	Value	Description
DIOOUT	0	Port is an output.
DIOIN	1	Port is an input.
DIOINOROUT	2	Port can be configured as in or out.
DIOINANDOUT	3	Port is an input and an output.

Baud Rate Codes

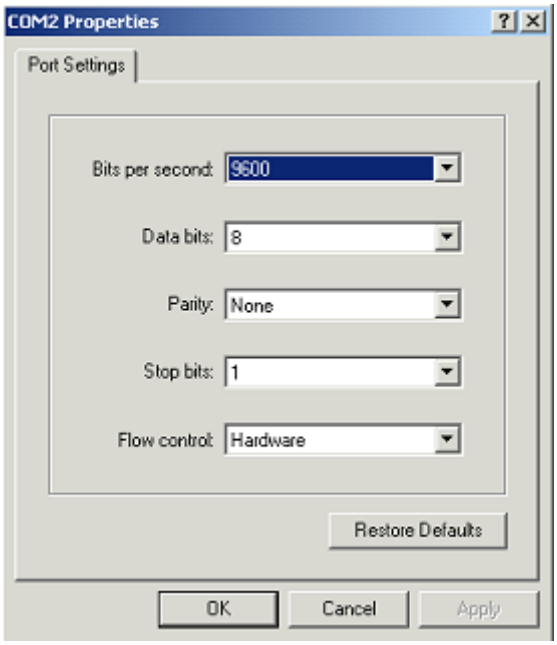
Name	Value	Description
BAUDRATE_300	0	Serial Device baud rate is 300 baud.
BAUDRATE_1200	1	Serial Device baud rate is 1200 baud.
BAUDRATE_2400	2	Serial Device baud rate is 2400 baud.
BAUDRATE_4800	3	Serial Device baud rate is 4800 baud.
BAUDRATE_9600	4	Serial Device baud rate is 9600 baud.
BAUDRATE_19200	5	Serial Device baud rate is 19200 baud.
BAUDRATE_28800	6	Serial Device baud rate is 28800 baud.
BAUDRATE_38400	7	Serial Device baud rate is 38400 baud.
BAUDRATE_57600	8	Serial Device baud rate is 57600 baud.
BAUDRATE_115200	9	Serial Device baud rate is 115200 baud.

C

C.Troubleshooting

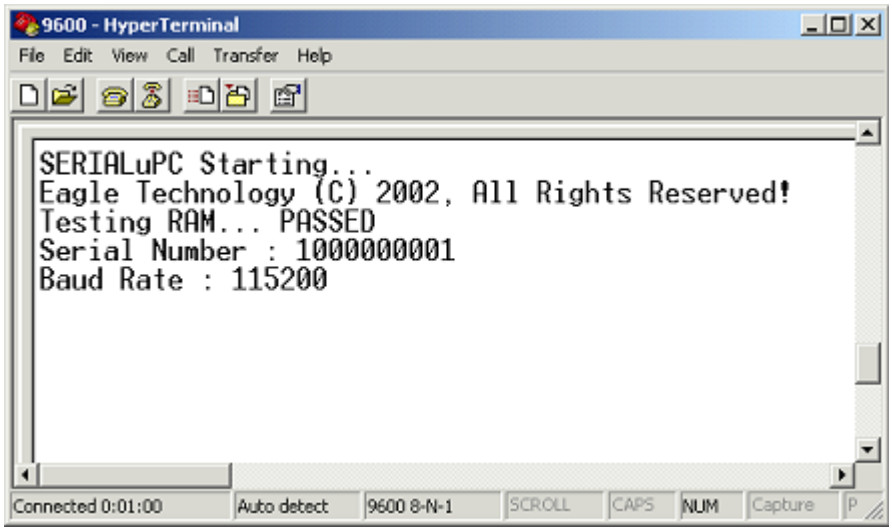
SRL Device Unavailable

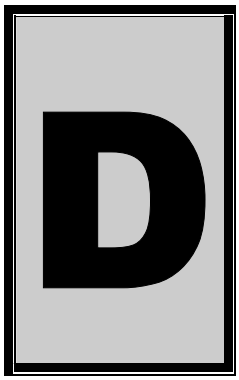
- Make sure that the Serial Number is corresponding with the Serial Number on the device.
- Check that cable is in the correct serial port.
- Check that your Baud Rate is setup correct, default baud rate is **9600** baud.
- If the baud rate have been changed, the new baud rate can be checked by using **HyperTerminal.**
- Disconnect the power to the device.
- When running HyperTerminal, create a **New Connection** and set the baud rate to 9600. See picture below.



Select OK

- Reconnect the power to the device. It should display the serial number and also the baud rate at witch the device is going to run at. See picture below.


9600 - HyperTerminal
File Edit View Call Transfer Help
SERIALuPC Starting...
Eagle Technology (C) 2002, All Rights Reserved!
Testing RAM... PASSED
Serial Number : 1000000001
Baud Rate : 115200
Connected 0:01:00
Auto detect
9600 8-N-1
SCROLL
CAPS
NUM
Capture



D.Ordering Information

For ordering information please contact Eagle Technology directly or visit our website www.eagledaq.com. They can also be emailed at eagle@eagle.co.za. Currently only the following version are available.

Board	Description
SRL 24A	24 channel digital I/O SERIAL device
SRL 24C	24 channel digital I/O & counter-timer SERIAL device
SRL 48A	48 channel digital I/O SERIAL device
SRL 48C	24 channel digital I/O & counter-timer SERIAL device
SRL 72A	72 channel digital I/O SERIAL device
SRL 72C	24 channel digital I/O & counter-timer SERIAL device
SRL 96A	96 channel digital I/O SERIAL device
SRL 96C	24 channel digital I/O & counter-timer SERIAL device
SRL 120A	120 channel digital I/O SERIAL device
SRL 26	16 channel analog input USB device
SRL 30	16 channel & 4 channel analog input/output SERIAL device
SRL 73T8	8 Channel Thermo Couple input SERIAL device
SRL 73T16	16 Channel Thermo Couple input SERIAL device
SRL 73T32	32 Channel Thermo Couple input SERIAL device
SRL 73R8	8 Channel RTD input SERIAL device
SRL 73R16	16 Channel RTD input SERIAL device
SRL 73R32	32 Channel RTD input SERIAL device

Table D-1 SERIAL μDAQ Ordering Information